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# Terms of Reference for the Assessment of Grid Absorption Capacity, Preparation of a Grid Code, Feed-in-Tariffs and Model Power Purchase Agreements for Renewable Energy Systems in a Small Island State

## BACKGROUND

In order to promote renewable energy production, Strategic Objective (1) of the [Country] Sustainable Development Strategy calls for the development of a grid code, feed-in tariffs, and power purchase agreements. The [Country] views the expansion of its electricity generation capacity through the utilization of renewable energy resources as central to its longer-term development prospects. The objective is to utilize renewable sources of energy to the maximum extent possible, taking into consideration the grid absorption capacity. The latter is of utmost importance given that the [Country] an insular country with no interconnection facilities. Moreover, there is a need for the [Corporation in charge of Public Utility] to ensure reliability and stability of supply while reckoning the fact the renewable energy technologies are generally variable in nature.

The main deliverables required are:

* Assessment of the Renewables Grid Capacity absorption under the current circumstances and recommendations to allow higher levels of RE penetration.
* Preparation of a Grid Code for the Low and Medium Voltage network and a list of recommendations for the short term integration of variable renewables into the grid
* Develop the Feed-in-Tariffs and Financial Model across technologies
* Draft model of Small Scale Distributed Generation (SSDG) and Medium Scale Distributed Generation (MSDG) Power Purchase Agreements (PPAs) for Renewable Energy Systems.

## TASKS and RESPONSIBILITIES

The Consultants shall:

Through discussions with the [Ministry in charge of Environment and Energy] and [Corporation in charge of Public Utilities], the [Commission in charge of Energy] and other stakeholders, the Consultants will be required to submit (1) a study about the RE Absorption Capacity in the islands (2) Grid Code for the Low and Medium Voltage network, (3) Feed-in- Tariffs and Financial Models across technologies, and (4) Draft model SSDG and MSDG (as required) Power Purchase Agreements (PPAs) for Renewable Energy Systems.

### Task 1: Study about the RE Absorption Capacity in the Regions

The consultant should assess and advise on the amount of renewable generation that the system can safely absorb (at system-wide, substation, and feeder levels) in relation to projected demand (to be provided by the [Corporation in charge of Public Utilities]) without jeopardizing the safety and reliability of the grid.

Taking into account the RE potential in the islands evaluated in prior studies, the consultant will assume a realistic energy mix including PV(including both, utility scale and distributed rooftop PV connected to the grid), wind (both, small and large turbines), waste to energy and the current diesel generation, and will analyse the potential impact on the electricity system and provide recommendations in order to achieve the RE penetration targets of 5% in 2020 and 15% in 2030, and higher levels for the future.

Due to the relatively small cross-section of typical MV feeders even small scale generators can substantially influence voltage quality in a local area causing limit values for over voltage to be exceeded. The precise capacity limit of certain generator types that can be grid-connected at a specific site without impairing the quality of supply can in fact only be determined by detailed studies at connection points of interest.

This technical assessment is intended to assess the amount of renewable energy the grid can accommodate, but the amount to be absorbed will be subject to affordability.

### Task 2: Definition of the technical interconnection requirements for RE systems and operational control system needs

This task will include:

Define a grid code for the interconnection of renewable systems to [Corporation in charge of Public Utilities] electricity grid. This grid code will describe technical criteria and requirements for inter-connection of Small and Medium Scale Distributed Generation (SSDG, and MSDG) in consultation with the [Corporation in charge of Public Utilities] including voltages and frequency range of operation and requirements to integrate such sources into system operations (e.g. power output and ramp control);

The code must cover the following variable renewable energy technologies: wind, solar PV, and hybrid systems connected to the Low and Medium Voltage grid, including the relevant differentiations depending on the capacity of the system, technology, application and licensing requirements (as per the Energy Bill of [Country]). The consultant will also evaluate if any special provision will be required with regard to the integration of biomass system.

Determine the immediate needs with regard to systems control and operations that the [Corporation in charge of Public Utilities] would need to implement to ensure 5% of variable RE is reliable integrated into the electricity grid by 2020, and further recommendations to be implemented by 2030 (15% RE target). These actions may include, but not limited to the following: (i) adjustment of the generation control philosophy, (ii) introduction of Automatic Generation control (AGC) or other control function for generation control, (iii) other considerations with regard to voltage management in the grid and generation forecast and scheduling.

### Task 3: Feed-in- Tariffs and Financial Models across technologies

This task will follow the following steps:

(i) Carry out a review of feed-in tariffs and other incentive schemes for mechanism including net metering and auctions for renewable projects from at least three countries in which these tariffs and schemes have been implemented successfully.

(ii) Determine for each type technology (wind, solar PV, hydro, biomass, waste to energy and hybrid systems), the different costs of investment, O&M costs, life cycle of equipment, payback periods, local conditions (inflation, interest payment, ROI etc.), and comparative prices in other SIDS.

(iii) Determine the variable integration costs as a consequence of having SSDG & MSDG in terms of investment in new power plants, fuel costs, spinning reserve, and line losses.

(iii) Propose a feed-in tariff structure for the abovementioned technologies with technology-specific tariff levels, to be differentiated according to size and/or overall amount of electricity generated. Establish the criteria of eligibility for the FIT and provide advice on how hybrid systems should be incorporated into the feed-in tariff structure. The feed-in tariffs levels to be recommended should be accompanied by a scientific methodology reflecting market prices and finance costs that can be used as a benchmark or reference point for assessing similar projects. Develop a tariff model in EXCEL format together with an instruction manual, data check list and block diagram describing the data flow of the model.

The [Corporation in charge of Public Utilities] would prefer that a flat feed-in tariff structure be implemented over the lifetime of the agreement. However, the consultant should justify all the rate settings through calculations, computations, graphical representations, and, if necessary, propose a tariff revision mechanism that is flexible (cater for technology evolution, attained installed capacity etc. i.e. predetermined digression) but which also gives reasonable investment comfort.

(iv) Propose incentive schemes – based on international best practices - for each type of SSDG and MSDG to cater for the difference between [Corporation in charge of Public Utilities] marginal cost of generation - and the required feed-in tariff to make the use of SSDG and MSDG viable. The consultant is expected to propose alternative and innovative financing mechanisms outside of Government funding, to maintain sustainability and affordability of the feed-in tariffs.

(v) The Consultant should also assess the overall impact of such Feed in Tariffs on the financial situation of [Corporation in charge of Public Utilities] including but not restricted to the increase in average and marginal cost per KWh if the latter has to absorb it all and pass it through to its customers.

The consultant should explore the potential organizational impacts of implementing the business processes and procedures, the expected requirements in terms of structure, human resources, billing, information system, etc., for compliance with the feed-in tariffs recommendations and incentives scheme to be applied.

The consultant should also propose the necessary control mechanisms to avoid the installation of more RE capacity than the economically sustainable in the medium and long term.

*The final decision on whether to adopt the feed-in tariffs proposed by the consultant will rest with the [Corporation in charge of Public Utilities] based on affordability and sustainability of the mechanism. The [government] will decide if the FIT levels will be the determined by the consultants on a cost plus basis or via competitive bids, a decision to be made depending on the circumstances, on the selected technology and on the specific micro location.*

### Task 4: Power purchase agreements models

Depending on the outcomes of Task 3, the consultant should determine, in coordination with the [Corporation in charge of Public Utilities] if Power Purchase Agreements (PPAs) would be required for all renewable systems or just for some of them (depending on the capacity installed or the type of technology). For example, the FIT may be fixed for small projects and be specified by law, and could be determined by reverse auctions for medium-big size projects. The consultant should draft model PPAs for the required Renewable Energy Systems. The PPA will be the binding contract document between the [Corporation in charge of Public Utilities] and the seller. The PPAs will cover but not be limited to the following items:

* Rules of Interpretation, Language and Definitions
* Representations, Warranties and Covenants
* Term of Agreement
* Development, Construction and Commissioning
* Facility Description
* Predevelopment Period
* Obligations during Predevelopment Period
* Development Security
* Construction Period
* Obligations during Construction Period
* Construction Milestones
* Commercial Operation Date
* Deemed Commercial Operation Date
* Payment for Electrical Energy
* Invoicing and Payment for Energy Charges
* Operations
* Facility Operation
* Planned Maintenance Outages
* Measuring Devices (evaluate the option of net metering for household systems)
* Electrical Energy Metering System
* Interconnection Facilities
* Insurance
* Default and Limitation of Liabilities
* Damages, Limitation on Damages, Suspension and Remedies Cumulative
* Force Majeure
* Termination
* Dispute Resolution
* Indemnities
* Change of Control
* Waiver
* Disclaimer of Third Party Beneficiary Rights
* Governing Law
* Confidentiality and Publicity
* Consents and Approvals

## TIMEFRAME and DELIVERABLES

The Consultant shall be required to undertake 2 missions (Week 1 and Week 12) to [Country]. During the assignment, the Consultant will consult as required with the [Corporation in charge of Public Utilities], the [Country Energy Commission] and the [Ministry in charge of Energy and Environment] on all issues where the need is felt on either side. All necessary background documents and technical information will be provided to the Consultant at project inception.

The primary deliverables of the assignment will comprise complete sets of documents as listed below:

* Inception Report at the end of Week 1
* Draft Report on the Tasks as above – End of Week 3
* Draft Final Report including a non-technical executive summary report – end of week 9
* Final Report including a non-technical executive summary report - at the end of week 12

The Consultant will prepare an Inception report which will contain inter alia a work plan, methodology, activities and schedule for the conduct of the assignment. The Client ([Corporation in charge of Public Utilities] and [Government of Country]) reserves the right to propose amendments to the Inception report for consideration by the Consultant.

It is important to note that after the Draft Report will be submitted to the Client, comments will be forwarded to the consultant by the end of Week 5.

The Draft Final report will then be submitted (within 2 weeks of submission of comments to the Client) ahead of the second visit of the Consultant to [Country].

In [Country], the Consultant will present the Draft Final Report to the Client and other stakeholders and participate in a workshop if required.

Following the final comments received, the Consultant shall then promptly submit the final report incorporating the comments as appropriate.

The documents must be delivered in Microsoft Word and pdf versions. The model must be delivered in Excel format.

The Consultant shall formally submit his report and presentations to the [Corporation in charge of Public Utilities], the [Country Energy Commission], the [Ministry in charge of Energy and Environment] and the [Donor], views and approval according to the time frame above.

## INFORMATION TO BE PROVIDED BY THE CLIENT

The client will provide relevant information from similar projects developed for other small islands such [Country] and others (e.g. grid codes and studies about incentives mechanisms for Renewables). Given the similarities, this information is considered to be an important reference that could contribute to facilitate the work of the consultants and the resources to be allocated to produce the outcomes mentioned in the scope of work.

## IMPROVEMENT TO TERMS OF REFERENCE

The Consultant may offer suggestions to improve the Terms of Reference that would result in better achievement of objectives and implementation of the assignment. Suggestions if accepted by the [Corporation in charge of Public Utilities], will form part of the Terms of Reference of the contracted assignment.

## LANGUAGE

The language of the assignment shall be [Language]. All deliverables shall be in [Language].

## PAYMENT

### Payment Schedule

* 25% upon submission of Inception Report;
* 40% upon deliverable of draft Final Report
* 35% upon deliverable of Final Report